ANNOUNCEMENT

EXTENSION TO THE STANDARD ATMOSPHERE

A new extension to the 20 kilometer ICAO Standard Atmosphere (the accepted U. S. standard) is being adopted by about 23 United States scientific and engineering organizations; this extension provides tables of atmospheric parameters up to 300 kilometers. Because of their great need for such tables and because many have active high altitude research programs, these organizations met in November 1953 to seek agreement upon a single representation of the atmosphere compatible with the best available data. The United States Weather Bureau of the Department of Commerce and the Geophysics Research Directorate, Air Force Cambridge Research Center of the Air Research and Development Command, co-sponsored this movement which included the following participants:

Air Research and Development Command
*Air Technical Intelligence Center
Air Weather Service
Applied Physics Laboratory
Ballistics Research Laboratory
Boston University (member transferred to Sylvania)
Bureau of Aeronautics, USN
Civil Aeronautics Authority
CONVAIR, San Diego
CONVAIR, Fort Worth
Geophysics Research Directorate (AFCRC)
Harvard College Observatory
*International Civil Aviation Organization
Jet Propulsion Laboratory
National Bureau of Standards
Naval Proving Grounds
Naval Research Laboratory
Office of the Chief Signal Officer
The Rand Corporation
Redstone Arsenal (ABMA)
Signal Corps Engineering Laboratory
United States Weather Bureau
White Sands Proving Grounds
Wright Air Development Center

A working group was appointed to study the problem. This group met several times since 1953 and recommended the basic values and parameters shown in table 1. These values have now been approved by nearly all the participants listed above. A curve of T_M vs. H is shown in figure 1.

*Observer

Extensive tables expanding the basic framework of table 1 are currently under preparation at the Geophysics Research Directorate and will follow closely the format of the ICAO Standard Atmosphere which appears as ICAO Document 7488, NACA TN 3182, and NACA Report 1235; moreover additional information, important at higher altitudes, such as gravity ratio and molecular weight will be included. Supplemental information to describe the variability of the atmosphere and other parameters will be issued later as appendices. Preliminary copies of these tables, in a form analogous to the NACA TN 3182 should be available in limited quantities during 1957. It is planned to have the final edition printed by the Government Printing Office and made available to the public through the Superintendent of Documents.

By virtue of the wide participation in this effort, these 23 organizations established a U. S. standard and are planning action through the Air Coordinating Committee and ICAO to obtain international acceptance for the lowest portion (20 to 32 kilometers) of the tables. In

Table 1.—United States extension to the standard atmosphere

H (m′)	Z (m)	L (°/m′)	T_M (°K)	T (°K)	M (gr/mole)	P (mb.)
0.00	0.00		288.16	288.16	28.966	1.01325×10^{3}
		−0.0065				
11,000.0	11,019		216.66	216.66	28.966	2.2632×10^{2}
		0.0000				
*20,000.0	20,063		216.66	216.66	28.966	5.4748×10^{1}
		0.0000				
25,000.0	25,099		216.66	216.66	28.966	2.4886×10^{1}
		0.0030				
*32,000.0	32,162		237.66	237.66	28.966	8.6776×10^{0}
		0.0030				
47,000.0	47,350		282.66	282.66	28.966	1.2044×10^{0}
		0.0000				
53,000.0	53,446		282.66	282.66	28.966	5.8320×10^{-1}
		−0.0039				
75,000.0	75,895		196.86	196.86	28.966	2.4521×10^{-2}
		0.0000				
90,000.0	91,294		196.86	196.86	28.966	1.8154×10^{-3}
		0.0035				
126,000.0	128,548		322.86	**278.88	**25.02	1.4510×10^{-4}
		0.0100				
175,000.0	179,954		812.86	**686.13	**24.45	6.1895×10^{-7}
		0.0058				
300,000.0	314,859		1537.86	**1024.67	**19.30	1.4473×10^{-8}

*Top of current ICAO Standard and top of recommended extension for standardization—no discontinuity in temperature-height curve.
**Approximate values subject to minor revision depending upon recomputation of M above 90 km.
Z = Altitude in geometric meters
H = Altitude in geopotential meters
L = Temperature lapse rate in Kelvin degrees per geopotential meter
T_M = Molecular-scale temperature in degrees Kelvin
T = Real kinetic temperature in degrees Kelvin
M = Molecular weight in grams per mole
P = Pressure in millibars

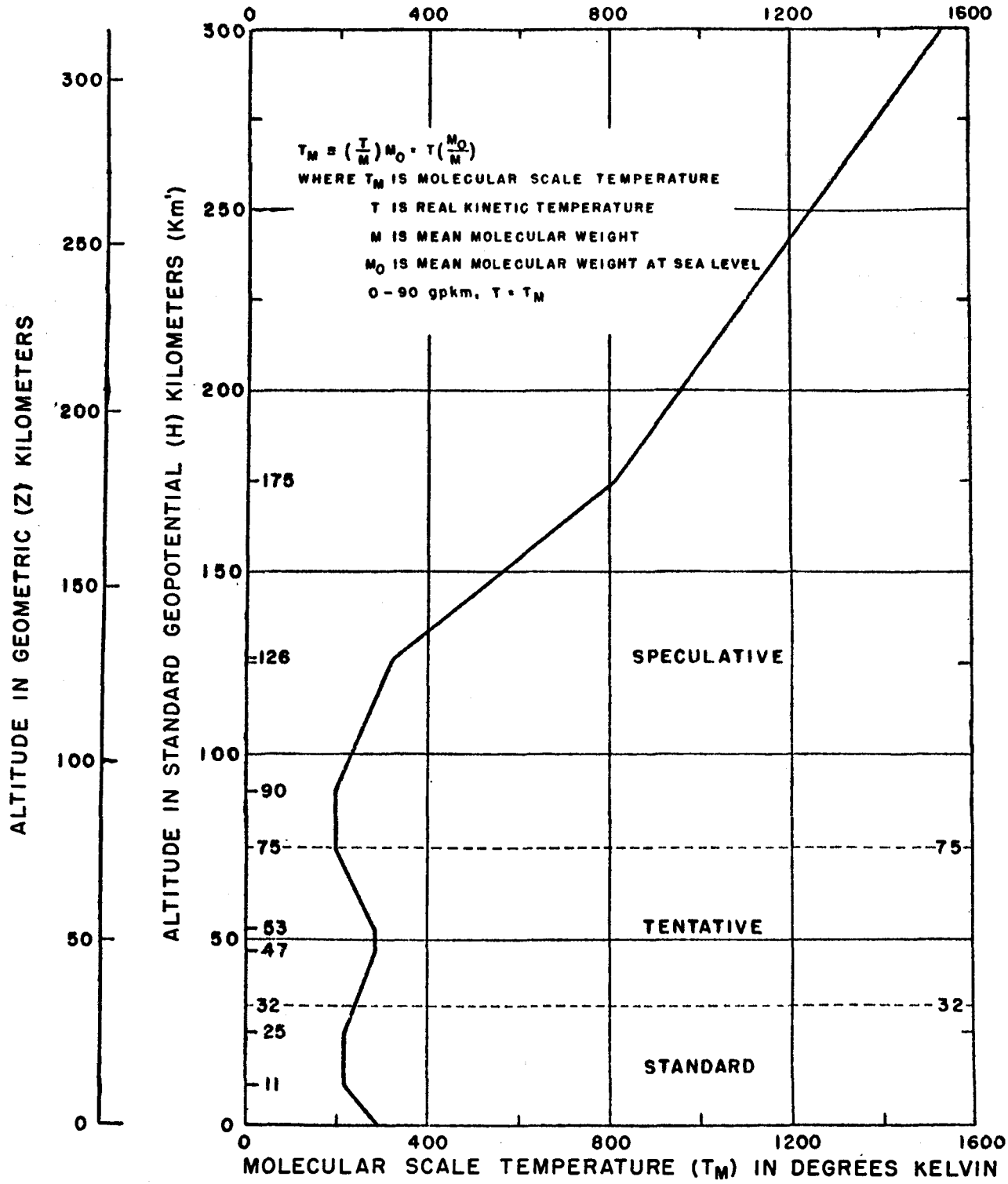

FIGURE 1.—Molecular scale temperature versus geopotential altitude.

this regard, it should be noted that the 75 to 300 kilometer interval of the extension is termed "Speculative Atmosphere," since it is felt that new experimental data obtained over the next five or ten years may lead to a better representation. The interval 32 kilometers to 75 kilometers has been termed "Tentative Atmosphere," since more data may also lead to modification and also because any drastic change in the "Speculative Atmosphere" may require some change in the adjacent lower levels. The 20 to 32 kilometer interval is termed "Standard," since it is a good compromise between the voluminous radiosonde data of the meteorological services and tables already firmly entrenched in the development of engineering equipment. No changes are foreseen for this interval.

Geophysics Research Directorate scientists, R. A. Minzner, and W. S. Ripley, are now preparing the completed report.

Harry Wexler; *Norman Sissenwine*
USWB *GRD, AFCRC*
Co-Chairmen

Committee on Extension to the Standard Atmosphere, U. S. Weather Bureau and Geophysics Research Directorate (AFCRC), Co-sponsors

Oct. 26, 1956